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ALTERNATIVE APPROACH TO MANAGEMENT OF CORONARY ARTERY PERFORATIONS

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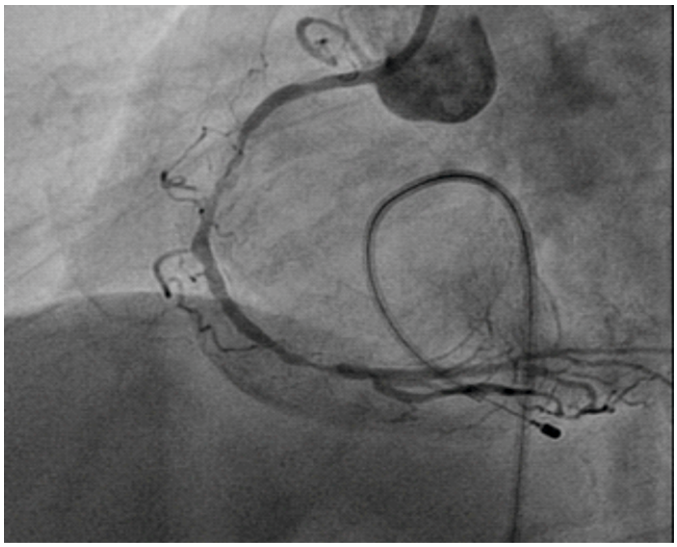
ABSTRACT

A coronary artery perforation is a dreadful complication of percutaneous coronary interventions. Even though coronary artery perforations amount to only 0.3-0.6% of all complications they have serious consequences resulting in an 8% incidence of death, an 18% incidence of myocardial infarction (MI) and a 13% need for emergency surgical management.[1] We report a case of iatrogenic coronary artery perforation that was sealed using polyvinyl alcohol particles injected directly into the distal end of the artery.

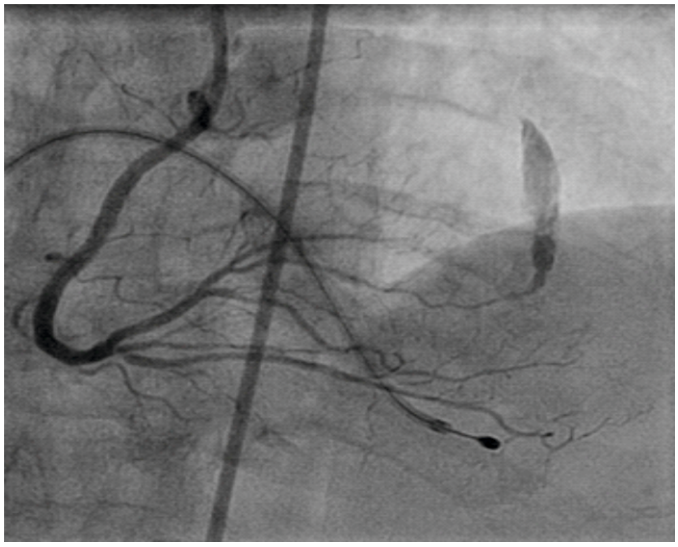
KEY WORDS: Complications in Angioplasty, PVA particles, Coronary Perforation, Covered stents.

Introduction:
With the wide spread prevalence of ischemic heart disease and increasing availability of PCI, Coronary Artery perforations are becoming increasingly common. They amount to 0.3-0.6% of all coronary related complications.[1] The incidence of perforations increases with use of coronary interventional devices intended to remove or ablate tissue, such as transluminal extraction coronary atherectomy, directional coronary atherectomy and high-speed mechanical rotational atherectomy. Percutaneous coronary intervention, which depends upon mechanical dilatation of the artery, is requisitely associated with plaque fracture, intimal splitting and localized medial dissection. These tears may extend into the media for varying distances, and may even extend through the adventitia resulting in frank perforation.[2,3] Balloon inflations and/or deployment of a covered stent may not be possible if the perforation occurs in a small, distal and/or side branch.

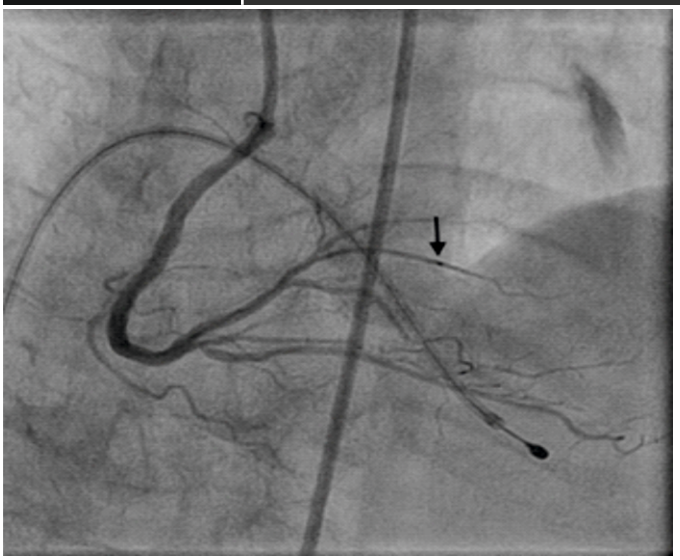
Case Report:
A 70-year male patient with a history of hypertension and diabetes was admitted with complaints of sudden onset left sided chest pain radiating to the left arm and associated with sweating for 2 hours. On presentation to the ER, his pulse was 50/min with blood pressure of 100/60 mmHg in the right arm. He was diagnosed with inferior wall myocardial infarction as his electrocardiogram showed ST elevations in II, III, aVF with a complete heart block and the echocardiogram showed inferior wall hypokinesia with LV systolic dysfunction (LVEF: 45%). He was not thrombolysed and taken up for PAMI.His coronary artery angiography showed two lesions in the RCA. A proximal 90% stenosis and a distal 80% stenosis. The left main was normal. The LAD showed two discrete lesions of 60% and 70% in the proximal segement. The Left Circumflex artery showed a diffuse type C lesion with a maximum stenosis of 80%. The RCA was cannulated with 6F JR 3.5 Launcher (Medtronic, Inc., Minneapolis, Minnesota) guide catheter. The lesions were crossed with 0.014" Rinato J tip PTCA guide wire. The lesion was dilated with Sprinter 2mm x 10mm balloon at 8 atm pressure.After adequate pre-dilataton, the lesions were stented with a Prolink 2.75mm x 30mm BMS stent (Vascular Concepts) in the distal segment and Prolink 3.0mm x 30mm BMS stent (Vascular Concepts) in the proximal segment. Post-stenting angiography revealed a clean stented segment, but a type-II perforationin the distal part of the PLV branch.Although the patient was haemodynamically stable, 2D echo showed mild pericardial effusion. A covered stent was not considered in view of the small calibre of the distal PLV. A 3 ml mixture of PVA particles with contrast agent was made to form a diluted, well-suspended solution and injected it into the distal PLV via a micro-catheter.Final injection revealed successful occlusion of leak site and no leak in the pericardial cavity.



Coronary Angiography showing RCA with proximal and distal lesion



Initial check shoot showing type II perforation.



Final Check shoot shows perforation getting sealed after PVA particles were injected via microcatheter (black arrow).

Discussion:

Coronary artery perforations are a rare but lethal complication of PCI that can result in life threatening cardiac tamponade. In the present era, the incidence of coronary perforations is 0.3-0.6%.[1] a dissection or intimal tear completely penetrates the arterial wall leading to vessel puncture with minimal dye staining or vessel rupture with brisk extravasations of blood and dye into the pericardial space.[4] The predictors of coronary artery perforations.

1. Clinical factors: Advanced age,[5] female sex,[5] renal impairment,[6] non-ST-elevation myocardial infarction patients[7].

2. Procedural factors: CTOs,[7] coronary artery calcification,[7] type-C lesions,[8] long target lesions (>10 mm), and eccentric lesions,[8] Use of hydrophilic/ extra stiff wires,[8]atherectomy devices,[9] increased balloon to artery ratio,[5] intravascular ultrasound guided PCI optimization and high-pressure stent post-dilatation,[10] and cutting balloons.[11]

Ellis et al.[5]has classified coronary perforations into three types: Type I:extraluminal crater without extravasation; Type II: pericardial or myocardial blushing; Type III: perforation ≥1mm diameter with contrast streaming and cavity spilling. Stiff and hydrophilic guide wires have been known to cause type I & II coronary perforations. Although such perforations may heal spontaneously, type II perforations have the potential to progress to tamponade.[7,8]Coronary perforations are often associated with increased morbidity and mortality (up to 7%).[7,12]Almost 40% of the cases with a perforation have Pericardial effusion[9] and around 10–20% of the cases can have tamponade.[7,9] Tamponade usually presents later and is associated with post-PCI hypotension. Cases with Epicardial and intramyocardial hematomas leading to compression of the left atrium have also been reported.[13]The commonly used methods of treating coronary perforations include prolonged balloon inflation (ballon to artery ratio of 1:1) proximal to or at the level of perforation and reversal of anticoagulation using protamine (target ACT of lower than 150 seconds).[10,13]Platelet transfusion is useful in patients treated with (GP) IIb/IIIa antagonists.Pericardiocentesis is done if cardiac tamponade is present.Previously used for occluding coronary aneurysms, covered stents have transformed the management of coronary perforations occurring in sizeable coronary arteries.[14, 15]Interventional Radiologists have used polyvinyl alcohol particles for many years for vascular embolization. It is made of inert plastic and is non-biodegradable. The mechanism of action involves acute inflammation, mural angionecrosis, fibrosis, and thrombosis.[16]It comes is a variety of sizes (45 μm-1180 μm) and is prepared by mixing with normal saline and contrast agent.[17] It is helpful in occluding smaller arteries.

Conclusion:

In conclusion, management of coronary artery perforations needs prompt recognition and classification. Early detection can minimize life-threatening complications and salvage a potential coronary artery. Expertize, attentiveness and caution is required when using guide wires and while dilating a coronary lesion. Use of covered stents has indeed revolutionized management of perforation in proximal and mid segments of large arteries. However, with the inability to use a covered stent due to anatomic limitations, use of other embolic agents such as polyvinyl alcohol is warranted and hence an interventional cardiologist should be aware of its utility.

REFERENCES:

1. Javaid A, Bunch AN, Satler LF, Kent KM, Suddath WO, Lindsay J Jr, et al. Management and outcomes of coronary artery perforation during percutaneous coronary intervention. Am J Cardiol. 2006;98:911-4.
2. Gruberg L, Pinnow E, Flood R, et al. Incidence, management, and outcome of coronary artery perforation during percutaneous coronary intervention. Am J Cardiol 2000;86(6):680-2, A8.
3. Dippel EJ, Kereiakes DJ, Tramuta DA, et al. Coronary perforation during percutaneous coronary intervention in the era of abciximab platelet glycoprotein IIb/IIIa blockade: an algorithm for percutaneous management. CathetCardiovascIntervent 2001;52(3):279-86.
4. Rogers JH, Lasala JM. Coronary artery dissection and perforation complicating percutaneous coronary intervention. J Invasive Cardiol. 2004;16:493–9.
5. Ellis SG, Ajluni S, Arnold AZ, Popma JJ, Bittl JA, Eigler NL, et al. Increased coronary perforation in the new device era.Incidence, classification, management and outcome. Circulation. 1994;90:2725–30.
6. Doll JA, Nikolsky E, Stone GW, Mehran R, Lincoff AM, Caixeta A, et al. Outcomes of patients with coronary artery perforation complicating percutaneous coronary intervention and correlations with the type of adjunctive antithrombotic therapy: Pooled analysis from REPLACE-2, ACUITY, and HORIZONS-AMI trials. J IntervCardiol. 2009;22:453–9.
7. Shimony A, Zahger D, Van Straten M, Shalev A, Gilutz H, llia R, et al. Incidence, risk factors, management and outcomes of coronary artery perforation during percutaneous coronary intervention. Am J Cardiol. 2009;104:1674–7.
8. Ramana RK, Arab D, Joyal D, Steen L, Chol L, Lewis B, et al. Coronary artery perforation during percutaneous coronary intervention: incidence and outcomes in the new interventional era. J Invasive Cardiol. 2005;17:603–5.
9. Witzke CF, Martin-Herrero F, Clarke SC, Pomerantzev E, Palacios IF. The changing pattern of coronary perforation during percutaneous coronary intervention in the new device era. J Invasive Cardiol. 2004;16:257–301.
10. Shirakabe A, Takano H, Nakamura S, Kikuchi A, Sasaki A, Yamamoto E, et al. Coronary perforation during percutaneous coronary intervention. Int Heart J. 2007;48:1–9.
11. Maruo T, Yasuda S, Miyazaki S. Delayed appearance of coronary artery perforation following cutting balloon angioplasty. Catheter CardiovascInterv. 2002;57:529–31.
12. Kiernan TJ, Yan BP, Ruggiero N, Eisenberg JD, Bernal J, Cubeddu RJ, et al. Coronary artery perforations in the contemporary interventional era. J IntervCardiol. 2009;22:350–3.
13. Krabatsch T, Becher D, Schweiger M, Hetzer R. Severe left atrium compression after percutaneous coronary intervention with perforation of a circumflex branch of the left coronary artery. Interact CardiovascThorac Surg. 2010;11:811–3.
14. Lansky AJ, Yang YM, Khan Y, Costa RA, Pietras C, Tsuchiya Y, et al. Treatment of coronary artery perforations complicating percutaneous coronary intervention with a polytetrafluoroethylene-covered stent graft. Am J Cardiol. 2006;98:370–4.
15. Jamshidi P, Mahmoody K, Erne P. Covered stents: A review. Int J Cardiol. 2008;130:310–8.
16. Gary P. Siskin et al. Embolic Agents Used for Uterine Fibroid Embolization. American Journal of Roentgenology. 2000;175: 767-773. 10.2214/ajr.175.3.1750767
17. Lewis A, Adams C, Busby W, Jones SA, Wolfenden LC, Leppard SW, et al. Comparative in vitro evaluation of microsphericalembolisation agents. J Mater Sci Mater Med. 2006;17:1193-204